احتمالات ومتغيرات عشوائية - امتحان اول

Specialization:	**Electrical Engineering, Communication Eng.**		**Palestinian National Authority** **Ministry Education & Higher Education** **Palestine Technical University** **College of Engineering & Technology**
Course Name:	**Probability and Random Variables**		
Date:	14/03/2011		
Time:	11:00-12:00		
Instructor:	Dr. Mutamed Khatib		First Exam Second semester 2010/2011
Name: [redacted] معن سلام قعدان		Section: احد ثلاثاء خميس 8-9	Mark: 18 /30

Q.1 *(3 marks)* Four of your friends are having birthdays on the same date. You purchased four birthday cards. How many different ways can you send cards to your friends so that each gets *one* card?

without replacement & with ordering

$$\text{ways} = \frac{n!}{(n-m)!} = \frac{4!}{(4-4)!} = \frac{4!}{0!} = \frac{4!}{1} = \boxed{4!}$$

✓ 3

Q.2 *(3 marks)* If $A \subseteq B$, $P(A) = 0.7$ and $P(B) = 0.7$, find $P(A \cap B)$

$P(A) = 0.7$ ← $\boxed{A \subseteq B}$

$P(B) = 0.7$ ←

$\therefore \boxed{A = B} \Rightarrow P(A \cap B) = \boxed{0.7}$

✓ 3

Q.3 *(3 marks)* $P(A) = p>0$, $P(B) = q>0$ and $A \cap B = \varnothing$, find $P(A \cup B|A)$

$P(A) = p > 0$

$P(B) = q > 0$

$A \cap B = \phi$

$$P(A \cup B|A) = \frac{P((A \cup B) \cap A)}{P(A)} = \frac{P(A)}{P(A)} = \boxed{1}$$

✓ 3

$\therefore P(A \cup B|A) = \boxed{1}$

تم الرفع بواسطة
م. معن أبو عيسى

Q4 The college of engineering in PTU opened 4 sections of probability at the beginning of the semester, TWO sections for Communications, ONE for Electrical, and ONE for computer. During add-and-drop week, the college opened a fifth section which is available only for communication and electrical students. Now, there are 5 sections:

Section 1: Communication
Section 2: Communication
Section 3: Electrical
Section 4: Computer
Section 5: Communication and electrical

You plan to choose a student at random,

(a) *(3 marks)* What is the probability that the student will be communications?

$\frac{1}{3} = 0.333$

(b) *(3 marks)* You took a section at random, and sample a student from that section. He's electrical! What is the probability that you chose section 5?

$$p(5|elec) = \frac{p(elec|5)\ p(5)}{p(elec)}$$

$$= \frac{(0.5)(0.20)}{0.333} = 0.30$$

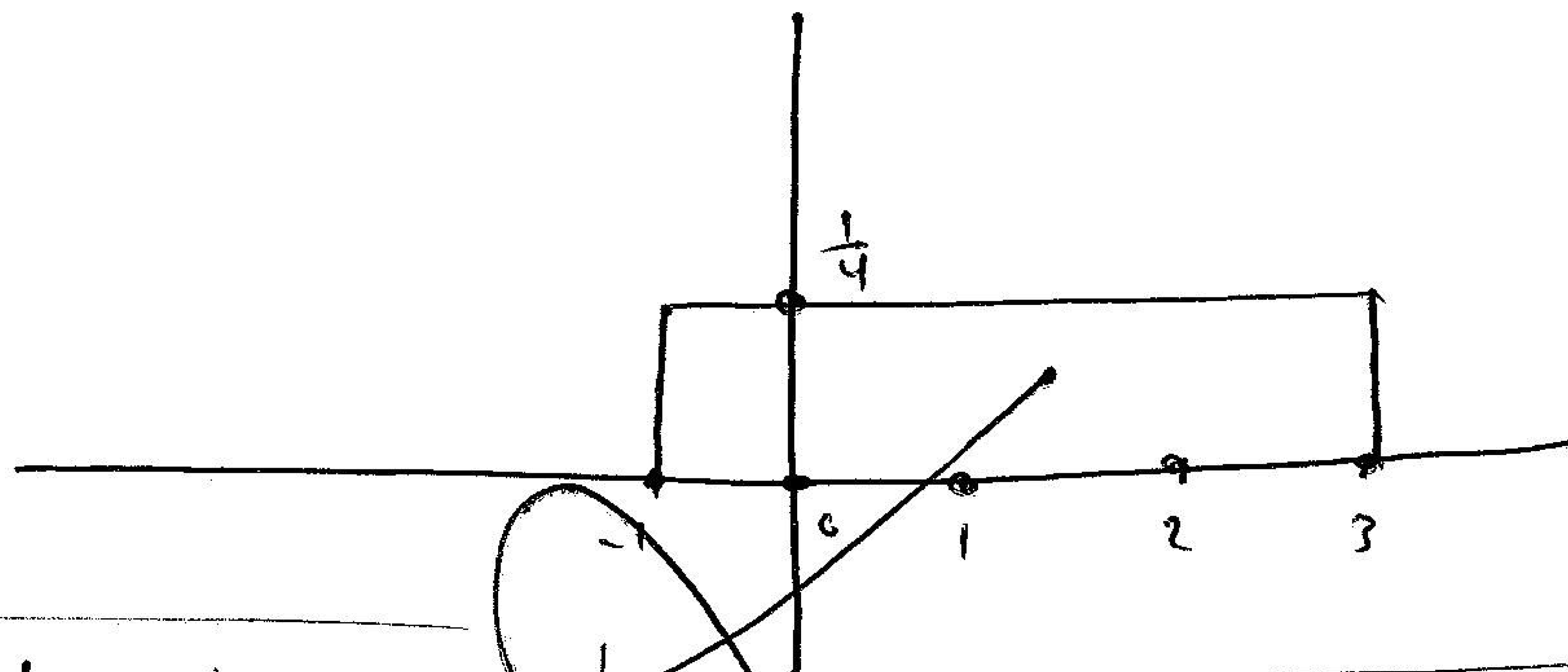


(c) *(3 marks)* You plan to sample one student from a section; he was computer, what is the probability that if you sample a second student from the same section, he will also be computer?

answer is 0.20

Q5. *(3 marks)* Plot the cumulative distribution function for a continuous random variable that follows a uniform distribution in the period from -1 to 3.

We want to plot CDF



$F_X(x) = \begin{cases} \frac{1}{4} & -1 \leq x \leq 3 \\ 0 & \text{else} \end{cases}$

$\frac{1}{b-a} = \frac{1}{3--1} = \frac{1}{3+1} = \boxed{\frac{1}{4}}$

Area under Curve must be 1

Q6. *(3 marks)* Find $P(X \leq 1)$ for the continuous random variable X with:

$$f_X(x) = \begin{cases} x/2 & 0 \leq x \leq 2 \\ 0 & otherwise \end{cases}$$

$P(X \leq 1) = F_X(1) = \int_0^1 \frac{x}{2} \, dx = \frac{x^2}{4} \Big|_0^1 = \frac{(1)^2}{4} - 0$

$= \boxed{\frac{1}{4}}$

Q7. *(3 marks)* Find the mean of the continuous random variable X with:

$$f_X(x)=\begin{cases}3x^2 & 0\le x\le 1\\ 0 & otherwise\end{cases}$$

$$E(X) = \int_{-\infty}^{\infty} x\, f_X(x)\, dx = \int_0^1 x(3x^2)\, dx = \int_0^1 3x^3\, dx$$

$$= \frac{3x^4}{4}\Big|_0^1 = \frac{3(1)^4}{4} - 0 = \boxed{\frac{3}{4}}$$

Q8. *(3 marks)* find $f_X(0)$ for the continuous random variable X with:

$$F_X(x)=\begin{cases}0 & x\le -1\\ 0.5(x+1) & -1\le x\le 1\\ 1 & x>1\end{cases}$$

$$f_X(0) = \frac{d\, F_X(x)}{dx} = \frac{d}{dx}(0.5x + 0.5) = \boxed{0.5}$$

$$\therefore\ f_X(0) = \boxed{0.5}$$